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SCIENCE

FRIDAY, JUNE 13, 1919

THE SCIENTIFIC SPIRIT¹

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THE scientific spirit, while not easy to define, is a reality, differing from the artist spirit in some important elements and differing also from the usual spirit in philosophy. William James, to be sure, made philosophy almost an experimental science, and religion may be and is so treated by a few. Perhaps as good a concise statement of the scientific spirit as we have is from the pen of Paul of Tarsus, who wrote: "Prove all things and hold fast that which is good." I wish to discuss this injunction with you for a few minutes, to direct your attention to a number of conceptions and practises built into our present social system which do not successfully endure such scrutiny as Paul suggested, and finally we will refer briefly to the scientific spirit in relation to some deep issues of the war and some profound problems of the post-war period.

Science versus tradition, experiment versus conformity to convention, scrutiny versus blind faith, reason versus custom. We are all creatures of habit, mental and physical. Indeed custom lies at the root of our whole social system, and necessarily so. Community life is dependent upon the dominance of social custom. A group of individuals each of whom went his own independent and unpredictable way would not form a real community. The conservative tendency in men, the habit of thinking and doing as their fathers thought and did, is essential in enabling them to live and work together as a cooperating society rather than be a mass of contending rival units. And one of the chief services this conservatism renders to human society lies in the difficulty which it presents to the

¹ Address by the president of the Ohio Academy of Science, at the annual meeting of the academy, in Columbus, Ohio, May 29, 1919.

entrance and adoption of new and strange conceptions or lines of conduct. The new, whether new in idea or merely new in emphasis, must fight and must find itself and prove itself in this initial struggle, before it can prevail. This struggle for existence among social ideas is the scientific experimental laboratory for society, and the whole social experimental method is dependent upon the natural human conservatism which causes and makes intense this struggle through which social ideas must pass to be accepted.

But I wish to emphasize this evening another aspect of the matter, the value of having new conceptions to test, and the importance of an attitude of impersonal search for the truth, rather than a struggle for personal advantage. "Ye shall know the truth and the truth shall make you free," free from subservience to unwarranted custom and, especially, free from self-seeking. Is not the scientific spirit epitomized in each of these two injunctions, which are but different statements of the same ideal—"Prove all things and hold fast that which is good," "Know the truth and the truth shall make you free"? The ideal, the habit, of impersonal search for the truth is one of two essential foundations of worthy society. The other fundamental social ideal is more explicitly stated by the great Jewish teacher—"As ye would that men should do to you, do ye even so to them." Given the natural quality of conservatism in man, then the essentials to sound society are untrammelled thinking and unselfish action.

Now both of these, untrammelled thinking and unselfish action, are part and parcel of the scientific spirit. In thought, truth for the joy of the knowing; in action, loyalty to truth so far as discerned. Are not these the core of the true spirit of science?

Most social customs have had a long development. Nearly every one has had an embryological and larval and adolescent history and it is of keen interest to trace any such custom back through its successive periods to the germ from which it started. During the period of development and growth

the custom is built into society and becomes almost a part of its organization. Changing it is like changing a physiological habit, removing it involves a surgical operation. It is not difficult to understand that such customs have the strongest hold upon society and upon most individual men.

Yet it is surprisingly easy, if one cultivates the habit, to adopt a detached attitude and to view these customs as scientific phenomena to be observed and appraised without prejudice. It is still more surprising to see how many of our important social customs, when so viewed, are without scientific warrant, are indeed socially absurd. Let us instance a few such mistaken social customs in illustration.

One of the most absurd of social economic conventions is the adoption of a single metal as a MEDIUM OF EXCHANGE, though this constantly fluctuates in value like any other product. An essential feature in a good medium of exchange is, of course, stability in value, so that debts will be paid in dollars of the same worth as the dollars or other consideration received when the debt was contracted.² Society has made no attempt to secure such an unfluctuating medium, but has merely chosen the most precious metal which is found in sufficient abundance. Irving Fisher is now proposing that the government charge a varying seigniorage for the coinage of gold, less when gold is dear, more when it is cheap, and thus keep the gold dollar of constant value. This seems to be along the right line, for the usability of gold as a medium of exchange depends upon both its intrinsic value and its monetization, the latter giving it the necessary fluidity and so affecting its value apart from normal supply and demand. Fisher proposes to establish the amount of seigniorage by comparing the value of gold from time to time with the then value of a composite group of natural products—grains, coal, metals, etc. There are but two sources of wealth, natural resources on the one hand, and human labor on the other. The medium of exchange should be of constant value with

² Investments as well as debts should, of course, be here included.

relation to both of these, and grains coal, metals etc., upon the market, are a combination of natural resources and human labor. Of course ultimately the medium of exchange should be determined and regulated internationally, not nationally.

In merely taking our most valuable abundant metal as a medium of exchange, as now, we are following without effort an old custom and are making no attempt to have our medium of exchange conform to the needs of society. Instead of attempting to solve the problem, we are accepting failure, and almost all men, because accustomed to this unsatisfactory medium, accept it without question. Conservatism versus reason. The blunder involved is one of the serious financial mistakes in our socio-economic system. We can all realize in these days the difficulties that come when the value of the dollar and the value of other things part company, and the purchasing power of our incomes is decreased by a third or more.

Another, more serious, economic error is the permitting of PRIVATE OWNERSHIP OF LAND AND OF NATURAL RESOURCES. There are two sources of wealth, natural resources and human labor, and the labor is wholly dependent upon the natural resources and can not exist without them. The foundation of life is therefore the Earth and its products. The absurdity of our present system is seen in the fact that it allows a Super-Rockefeller to own the whole Earth and in consequence to own its inhabitants, involving thus a super-form of slavery. There could be no greater economic blunder than this, for it involves the very foundation of human society. Fortunately the facts are recognized by some of our keener economists and somewhat hopeful attempts are being made to withdraw from this absurd plan of economic organization and get upon a basis that will recognize that the earth belongs to all men and must be preserved to them and for them. The fact that withdrawal from a false system involves the greatest difficulties is no sufficient reason for giving up the problem.

Our economic life has become so complex

that INDIVIDUALISM in large scale INDUSTRY is no longer reasonable. Over 90 per cent. of all men who engage in business fail at some time in their lives. The great percentage of failures shows the enormous risks in industry. Therefore the rewards to successful capital must be made proportionally great. Society pays dearly in the first place for the failures, and then she has to pay unreasonably for the successes. Capital can not be led to take the great risks without inducements adequate to the risks. The present industrial system is clearly unsatisfactory. Society must find some way to relieve industry from these great risks and must then organize the rewards upon a more reasonable basis. There are two most fundamental changes imperatively demanded in our economic system: the first is public control of land and natural resources for the benefit of all mankind; the second is such organization of essential industry as will allow society itself to carry at least the major part of the risks of failure. In this way the risk of failure would be greatly decreased, also the cost of industry, in the form of the returns to the successful, would be greatly reduced, and (probably most valuable of all) there would result a better balanced human community with less economic contrast between the extremes. It is futile to attempt to dodge solving this difficult problem. We must come to it eventually. Why not approach it now?

The real problem here is to introduce into all social effort the same spirit of putting the job through for the sake of the country and the world, which we have seen so finely exemplified in the war effort of our soldiers and of our people at home. Not only we, but all of our allies, have thrilled with this spirit of devotion to country and to the service of all the world. The perpetuation and strengthening of this same spirit and its introduction into all the life of the people is the real goal in the social reorganization which we seek. Under the present system of industry labor is prone to feel it is working not for the general good, but for the profits of capital. A spirit of selfishness and unwholesome rivalry is thus encouraged. Society can never ap-

proach its true goal until conditions are so changed that the very social organization shall itself encourage the spirit of altruistic service. Our soldiers, as they went over the top, were very conscious of ravished Belgium, and even their meaner tasks were dignified by a realization of the importance and necessity of the great job of which these tasks were a part. Putting the job through for the sake of the country and of all the world, that should be the general spirit. The socialistic scheme of eliminating private profit from industry would put industry on a patriotic basis and the spirit with which our soldiers fought and our people labored and saved might well be paralleled by the spirit in industry. Let our progressive reorganization of society keep in line with this goal, each step bringing us a bit nearer to its realization. The problem, however, is no simple one, for there must be no discouragement to individual initiative.

A far less fundamental, yet a huge economic blunder is seen in the adoption of fire insurance as a substitute for FIRE PREVENTION. I have no quarrel with fire insurance as such, but we are strangely blind when we let the partial protection of the individual through fire insurance cause us to feel such security that we continue to allow the commonwealth to suffer its huge fire loss which in America amounts annually to about two thirds the cost of building the Panama Canal. In all the nations of the world combined there has never been spent all told a hundred million dollars, or anything near that sum, in the study of the problem of fire prevention, though in the United States of America alone the annual loss by fire is from two and one half to three times that amount. Of course with sufficient expert study it would be easy to devise simple and inexpensive methods of protecting all buildings against fire. Wooden buildings, or even those with paper partitions, as in the city of Tokyo, could readily be so protected that a fire should not pass beyond the room in which it originated. Forest and prairie fires might be somewhat more difficult to prevent.

Little that is really worth notice is now

being done toward remedying this great economic blunder and no one is interested in any sufficiently broad way in its discussion. A government bureau, with many millions at its disposal, should be studying the problem. But scientific study is one of the most difficult things to secure. It is comparatively easy to persuade men to act, however ignorant they may be of the data involved in their field of action, but to get men to consent to large expenditure for study of a problem is a matter of the greatest difficulty. The scientific ideal of search for data before acting does not sufficiently appeal to the average man.

Again we can instance as unwarranted the allowing of private rivalries in a matter so vital as TRANSPORTATION, whether of persons, goods or messages. Society is so dependent upon transportation that its interest are paramount. In contrast, however, we have most of us known of railways which inconvenience public business to injure their rivals or to promote their own interests.

In our country we have a conspicuous instance of economic absurdity in our system of TAXATION. In ancient days it was customary in many countries to "farm out" the taxes to private collectors, making them pay a given sum into the treasury and permitting them to keep for themselves whatever amount beyond this they could succeed in raising. But to America alone, among modern occidental nations, belongs the distinction of continuing this ancient system to the present day. Our national government exposes the American citizen, without protection, to the brigandage of forty-eight separate states, each seeking to fill its own coffers from his pocket, and oblivious of the extent to which other states may already have plundered him. Our present system puts really irresistible pressure upon each state to offer inducements to investment of the capital of its citizens at home and to penalize by taxation its investment outside the borders of the state. I used to have stock in an Illinois corporation which owned the control of a business in Wisconsin, of another in Ohio and of still another in Tennessee, and each of these subsidiary com-

panies had property in other states than that in which its works were located, these properties all being reckoned in determining the market value of the stocks of the parent and of the subsidiary companies. As a resident of Ohio I paid Ohio taxes on all of these properties, either directly, or as a part of the stock value. As a stockholder of the parent Illinois company, I paid, through them, Illinois taxes on all the properties of all the companies. I also paid similar Wisconsin taxes on all the property of the Wisconsin company including taxes on their property in other states. Through them I also paid full taxes in other states on all their real property in those states. I paid Ohio taxes on all the property of the Ohio company, wherever located, and also taxes in other states on their property in those states. Similarly I paid taxes in Tennessee on all the property of the Tennessee company, wherever located, and I also paid taxes in several other states on property of the Tennessee company in those states. Full local taxes were paid on all realty in its own locality and, through the tax on corporation stocks, one to three additional taxes were collected upon most of this property. Many pieces of property paid four taxes on full valuation. And this is comparatively a simple instance. American citizenship, different from citizenship in any other western nation, does not protect a man from exploitation by the irresponsible agents to whom the taxing power is farmed out.

Of course the determination of the principles of taxation should be national, it being left to the several states and to the lesser community units to determine only the amount of money to be raised. There is widespread complaint of the injustice of our taxation system, and many are endeavoring through action in the several states to ameliorate the conditions, but no one is effectively attacking the problem in the only place where its possible solution lies, namely, in connection with national control. Of course this grotesque feature of our politico-economic system should promptly be removed.

The allowing of traffic in ALCOHOLIC BEVER-

AGES is an economic and social blunder which happily is about to be remedied.

The use of WAR as a method of settling international rivalries and disputes we hope may be abandoned as a result of education through the great war just closed. War, the result of allowing international relations to be those of unrestricted rivalry rather than of cooperation, is of course characteristic of an early stage of development of human society. As the principle of integration comes to have fuller sway and a society of nations is established with safeguards and sanctions similar to those prevailing within the several nations, war will disappear except in the form of riot against law. The most ancient human social unit is probably the family. There have emerged the clan, the tribe, the state, and now perhaps we see the travail of the birth of the world community from which war shall be banished.

A false and unsocial principle hitherto accepted is that the possession of wealth excuses a man in some degree from SOCIAL SERVICE. An emphasized form of this same principle makes the possession of wealth entitle a man to direct the labor of other men into channels promotive of his selfish interests irrespective of the relation of this form of labor to the general welfare. Closely related is the emphasis in our legal system upon property rights and interests in contradistinction to what we may call manhood rights and interests. There are those who, with Professor Carver of Harvard, claim that social principles can be given adequate expression in terms of economics, but I believe this to be false. Economics deals with property and with labor with reference to property, all of which, as I believe, is wholly subsidiary to manhood considerations. Sociology is not only the larger field. It is more fundamental. It is not unusual to hear economics referred to as a science and sociology as an unorganized and unscientific mass of data and ideas. I'm afraid it is largely a case of the pot calling the kettle black. It is remarkable how many "established principles" of economics are not true. Sociology is the larger field, yet each is so large and so com-

plicated and involved that conclusions of much breadth in either field are unreliable when they pass beyond a few major underlying principles. The mass of detail in each field is too great for us to have much confidence that we have successfully digested it.

There are some of us who are beginning to feel that the supreme blunder of human society is in allowing UNRESTRICTED BREEDING under conditions that even encourage, in fact, a relatively large production of the less desirable types of men. But I do not care to discuss eugenics at this time.

Is this list of social blunders sufficient to emphasize my point of the need for free-thinking men who approach a subject without undue bias, gathering and weighing data impartially, testing all things in the search for the truth and holding fast that which is shown to be good, good for society, without too much thought of its relation to what may be their own selfish interests? Is it not evident that "Denmark" is not the only state in which there is much of unsoundness? Could any mental attitude be more unjustified than that which led a certain philosopher³ to say—"Whatever is is right"? It would be nearer true to say—"Whatever is is wrong: the question is how wrong?"

The study of science, if properly conducted, and the study of other subjects by the scientific method, tend to free the mind from tradition and to lead one out into larger outlooks. One general type of scientific study, especially, seems to have this liberating, enlarging effect. I mean study in those fields of science in which the outworking from cause to effect occupies such immense, unthinkable stretches of time that the element of time loses its interest. Evolutionary studies, whether of living things or of Earth forms or stellar systems, involve such unthinkable lapses of time that the student neglects the time element and focuses his attention rather on the outworking of the principles involved. The economist or sociologist thinks usually in years or decades. The student of organic evolution, the geologist, the astronomer, rarely thinks in terms of

³ Pope.

time and when he does his time is measured in æons not in years. His thought centers in the outworking of the influences in operation and not upon the time it takes them to reach their goal. The oppositions to be overcome, the delays to be met, by these cosmic forces mean little or nothing. The student in these subjects comes to despise time as an element in his problems. The field is too vast for time to be of any interest. It is the principles involved, the outworking relations between phenomena, that command his thought.

Might it not be worth while to think occasionally of our economic and social problems in this same spirit, omitting time, ignoring the oppositions to be overcome, and dwelling rather upon the underlying truths and their ultimate, logical, necessary outworking?⁴ Truth is mighty and will prevail. When once it stands revealed, nothing can permanently stay its progress. Human prejudice and conservatism can only delay for a period, but not indefinitely. Why not do some of our social thinking in terms not of years or of decades but rather in terms of decades of centuries, freeing our minds from the shackles of the immediate with its confusion and its obstacles, and rising to the vision of things as they are and their necessary ultimate outworking? Let truth emancipate us with her free spirit, giving us to see beyond the present detail. In my twenty years of teaching I have watched many a student of organic evolution catching this broader view and learning, in his attitude to life and its problems, not to dwell wholly amid the details of the present but to appreciate as well something of the timeless march of the principles of truth.

If one has caught this idea and has spent occasional periods in the endeavor to grasp not the mass of detail but the more fundamental relations, he will find, I think, that his mind has been somewhat freed from its traditionalism. He will thereafter be a bit

⁴ I would not imply that thinking of social problems from the timeless viewpoint should at all replace the more customary study of these problems. I urge it only as a supplement to such study.

more open-minded toward unfamiliar ideas. His natural reaction may even change from one of initial opposition to the strange, to one of interest and inquiry. Labels may lose some of their blighting command over his thought and he may lose his fear of such words as Democrat, Republican, heretic, agnostic, socialist, capitalist, conservative,⁵ radical. The beginnings of freedom may be his.

Was there ever a time when there was more need than now for the unprejudiced spirit which shall receive with open inquiring mind the new ideas that are coming to the fore, and was there ever greater need for an impersonal unselfish spirit than in the social developments of the near future?

I fully believe that the organization of society is to be decidedly changed, that in our legal systems manhood rights and interests are to receive more emphasis in comparison with the rights and interests of property, and that selfish use of power by state or individual will be frowned upon and effectively restrained. The fight against slavery is won the world round. The fight against the special privilege of birth is already won in most countries, and through the aid of the great war will soon be won in all lands. The fight against the special and undue privilege of wealth is now fairly on and it will be a harder fight than either of the others and more searching in its test of the strength of our social bonds.

Any attempt to suppress the movement toward social rebuilding I believe not only to be foredoomed to failure in the end, but also to be extremely dangerous. Sitting on the lid beneath which is seething a deep discontent will merely delay action until the forces become beyond control, and will result in a dire explosion. Bolshevism and I. W. W. outrage will result and the civilization of the world will go into the melting pot. The great movement of the mass of mankind, the world round, toward reorganization of society upon a basis

⁵ It is a question whether heretic or conservative is the label more feared among American scientists. Conservatism is out of style and is itself almost heretical.

giving to all men a more just share in the organization, the control and the rewards of industry and in the joys of life is to-day so powerful and the stimulus from the great war is so intense that all nations will be stirred to the depths. Who are we in America that we should escape our share of the world travail in the birth of the new order?

Traditional conceptions will not help us here. Self interest is no safe guide. Indeed our greatest dangers are from prejudice and selfishness. The American labor unions and organized capital must change their intensely selfish pre-war spirit if they are to cooperate successfully in the work of reconstruction. Collective bargaining for the adjustment of the interests of organized labor and capital, with no representation of and little concern for the interests of the general public, will not take us far toward the true goal.⁶ Similarly the general prejudice of organized capital against socialistic tendencies is a hindrance to its rendering effective service in the solution of the problems. Labor's present feeling that it is working in considerable measure to increase the already undue profits of the capitalist develops an unsocial spirit, and so long as the present plan of organization of industry persists it is difficult to see how a more wholesome spirit can be engendered and fostered. The fine war service of both labor and capital shows a capacity for unselfish cooperation, if we can but reorganize society in such a way that all may feel that they are working directly for the common good and are getting a fair share of the rewards of their labor. The English labor party and such Americans as Brandeis, Wilson and Baker have their faces set toward the new day and are both open-minded and broad-minded. In such as they, not in the present spirit of American labor unions, lies chief hope of leadership. If instead of opposition to the seething social forces we may have sympathetic guidance, there is hope of progress without

⁶ I recognize, of course, the moderation and large-mindedness of the university professors' union and of some, at least, of the railway men's unions and possibly of some others.

cataclysmic disaster. The tremendous energy of the forces now stirring in society is too valuable to be wasted even if we could suppress it. It should be guided into the performance of valuable work. Led off through the proper channels and connected with the reorganized machinery of society it could do great things. But it must be led to service of society as a whole and not to service of any privileged class, proletariat, bourgeoisie, or aristocracy.

Class prejudice, class rivalries, class hatreds, any organized or individual self-seeking at the expense of others, must be fought wherever found and the open unselfish mind promoted. In leading and in upholding the hands of the leaders the men of true scientific spirit will effectively serve. They will be the leaven, helping the people to understand and accept the new order. The road to the new and better order is through intelligence and altruism, through appreciation of and devotion to the truth, that is through the scientific spirit. Does this seem a tame conclusion? It is old fashioned, as old fashioned as the man of Nazareth who is still unsurpassed in clear vision into the heart of the truths underlying human relations and in unselfish devotion to the truth as seen.

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SCIENTIFIC EVENTS

INTERNATIONAL COOPERATION IN MEDICINE

ACCORDING to the London *Times* a very large sum of money has been promised to found what will amount to a headquarters of the American Medical Association in England. The headquarters are to consist of a hospital, a library, lecture theaters, and demonstration rooms, reading rooms, and so forth. American doctors will thus possess a rallying point when visiting London, and the spirit of English medicine will be made free to them in a manner impossible by any other means.

It is understood that Lord Reading has accepted the presidency of the scheme and that Mr. Taft is much interested in it. The names of Messrs. Newton Crane and Van Duzen are

also associated with the work, while the secretary of the American College of Surgeons, Dr. Franklin Martin, of Chicago, has taken a prominent part in furthering it. The new hospital may, it is hoped in some quarters, become a kind of Rockefeller Institute in London. British medical men are anxious to give all the help they can.

The forthcoming general meeting of the American Medical Association at Atlantic City is likely to be attended by, among others, Sir Arbuthnot Lane and, it is hoped, Sir Bertrand Dawson, who will thus help further to cement the friendship which now exists between the profession in the two countries.

Efforts are also being made in Paris to increase the usefulness and importance of the British Hospital there. This hospital, the Hertford, is rather small and the site has certain drawbacks. A scheme recently put forward would transfer it to a new site in the Bois de Boulogne and would considerably enlarge its scope. Speaking at an informal gathering recently, Dr. Monod, a distinguished French doctor, declared that British doctors would receive the warmest welcome in his country, and expressed the hope that French doctors would be encouraged to go to England to study. This gathering, which was presided over by Sir Bertrand Dawson, included some of the most outstanding physicians, surgeons and medical officers in the British and Colonial professions.

THE TOTAL ECLIPSE OF THE SUN

PROFESSOR HENRY NORRIS RUSSELL, of Princeton University, writes in the *Scientific American* as follows:

The present month is notable for the occurrence of a great eclipse, which happens on the 29th, and affords the longest view of the surroundings of the sun, while its own disk is hidden, which has been possible for many years.

At the time of this eclipse the moon is within a day of perigee, and unusually near the earth—her distance being a little less than 224,000 miles. In consequence her tapering shadow is still nearly 150 miles in diameter where it reaches the earth's surface, and observers situated within the belt, about 8,000 miles in length, over which this shadow sweeps as it crosses the earth's disk, will see a